

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended in light of the following discussion is respectfully requested.

Claims 1, 5-18, 20, and 24 are now pending in this application. Claims 19 and 21-23 are herein canceled. Claims 1, 10, and 15 are herein amended. Support for the amendments is found at least in the claims and in the specification at page 5, lines 12-13 and 23, at page 7, line 25-page 8, line 2, and at page 10, lines 8-11. No new matter is added.

In the outstanding Office Action, claims 1 and 5-24 were rejected under 35 U.S.C. § 103(a) as obvious over Kondo, U.S. Patent No. 4,244,934, in view of EP 1211221A1, and further in view of McAllister, U.S. Patent No. 4,837,073.

Claim 1, from which claims 5-9, 20, and 24 now depend directly or indirectly, is herein amended. As presently amended, claim 1 is directed to a shaped expanded graphite article having an oxidation-resistant coating layer, at least in its outer layer portion. The oxidation-resistant coating layer comprises a boron element and a phosphorus element. The oxidation-resistant coating layer is 15 mass % or more boron element, and 2 mass % or more phosphorus element. Moreover, the content of the boron element in the oxidation-resistant coating layer is greater than the content of the phosphorous element in the oxidation-resistant coating layer. With this amendment, Applicants respectfully submit that claim 1, and the claims depending therefrom, are not obvious over Kondo, EP 1211221A1, and McAllister.

None of the cited references, individually or collectively, teach or suggest the article of claim 1. Kondo discloses a flexible graphite product coated with a specific antioxidant comprising a metal salt of a boric acid ester of a saccharide. Kondo does not teach or suggest a coating having 15 mass % or more boron element and 2 mass % or more phosphorus element, in which the boron content is greater than the phosphorus content. The Office asserts one skilled in the art would be led to combine the boric acid of Kondo with

phosphorus. However, this is not the case. Kondo specifically teaches away from the use of phosphorus as an antioxidant coating. In Comparative Example 1, at col. 11, lines 44-52, Kondo describes using a phosphoric acid solution instead of the boric acid solution taught by Kondo in Example 1, col. 10, line 65 to col. 11, line 43. As reflected in Table 1 of Kondo, this comparative example, using phosphoric acid, displayed significantly worse oxidation loss (52.2% vs. 37.6%), worse tensile strength (62 kg/cm^2 vs. 65 kg/cm^2), and worse specific resistance ($550 \text{ } \mu\Omega \text{ cm}$ vs. $600 \text{ } \mu\Omega \text{ cm}$), as compared to the example using boric acid. With such teaching away from use of phosphorus as an antioxidant coating, one skilled in the art would not be led to use phosphorus in combination with boric acid. One skilled in the art would expect such a combination to be inferior.

The EP 1211221A1 reference teaches a coating of graphite with phosphorus compounds. The EP reference would not motivate one skilled in the art to make the presently claimed invention. The EP reference is silent about boron. However, it clearly teaches that there is an upper limit to the amount of anti-oxidant treatment that is effective in making a protective coating. For example, the EP reference teaches in paragraph 0012 that increasing the content of phosphate to greater than 16% by weight tends to degrade the flexibility of the graphite article. With this teaching, one skilled in the art would not be led to the presently claimed invention, which includes at least 17 mass % total of boron element plus phosphate element, as he would expect such a coating to result in degradation of the flexibility of the coated article.

The McAllister reference describes coatings having boron and phosphorus elements. However, McAllister does not teach or suggest a coating having 15 mass % or more boron element and 2 mass % or more phosphorus element, in which the boron content is greater than the phosphorus content. Like the other references, McAllister teaches away from the present invention. Table II of McAllister shows the content of penetrants designated as A, B,

C, and D. The content of the boron element decreased from 1.8% in A to 0.6% in D, and the phosphorus element content increased as the boron decreased. Table IV of McAllister shows that the oxidation loss is decreased as the boron content is reduced. Contrarily, the present invention features an antioxidant coating in which the boron element content is greater than the phosphorus element content. One skilled in the art would not be led to such a combination by McAllister. Moreover, the present invention is a significant improvement over the McAllister invention, as the present invention results in prevention of oxidation at 800°C, while the McAllister invention was effective only up to 650°C.

One skilled in the art would not be motivated by the combination of Kondo, EP 1211221A1, and McAllister to make an antioxidant coating having 15 mass % or more boron element and 2 mass % or more phosphorus element, in which the boron content is greater than the phosphorus content. Kondo clearly teaches away from combining boric acid with phosphorus because of the inferiority of phosphorus as an antioxidant. The EP reference teaches away from inclusion of greater than 16 mass % antioxidant element in the coating. Finally, McAllister teaches that mixtures of boron element and phosphorus element having less boron would have improved antioxidant function, contrary to the present invention. Because the cited references, individually and collectively, teach away from the presently claimed invention, they cannot render claim 1 nor the claims depending therefrom obvious. Accordingly, Applicants respectfully request the withdrawal of the rejections of claims 1, 5-9, 20, and 24.

The Office has rejected claims 10-18 as obvious over Kondo, in view of EP 1211221A1, and further in view of McAllister. In the rejection, the Office asserts that these are product-by-process claims, and that they are obvious because the product claimed is the same or obvious over the product in Kondo, the EP reference, and McAllister. Applicants remind the Office that product-by-process claims are directed to products made by recited

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process steps. The claims at issue are clearly method claims, with process steps. However, to further clarify and expedite prosecution, Applicants herein amend claims 10 and 15 to remove the dependency from product claims. Applicants submit that, with such amendment, claims 10-18 are in condition for allowance.


In light of the above discussion, the present application is believed to be in condition for allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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